भारतीय मानक

Indian Standard

IS 1689 : 2023

सूती वस्त्र सामग्री की बेरियम गतिविधि संख्या के निर्धारण के लिए विधि

(दूसरा पुनरीक्षण)

Method for Determination of Barium Activity Number of Cotton Textile Materials

(Second Revision)

ICS 59.060.10

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Chemical Methods of Test Sectional Committee, TXD 05

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards after the draft finalized by the Chemical Methods of Test Sectional Committee had been approved by the Textiles Division Council.

This standard was first published in 1960 and subsequently revised in 1973. This revision has been made in the light of experience gained since its last revision and to incorporate the following major changes:

a) Amendment 1 has been incorporated;
b) Apparatus and reagent have been updated; and
c) Reference to the Indian standards have been updated.

Apart from lustre the absorption capacity of cotton is greatly increased by mercerization. Mercerized cotton absorbs soluble alkaline hydroxides to a greater extent than unmercerized cotton. Barium hydroxide is more readily absorbed by cotton cellulose than other alkalis and its absorption is convenient to measure. This barium hydroxide absorption test thus indicative of the cotton material having undergone the process of mercerization. If unmercerized cotton is indicated by barium activity number 100, the barium activity number above 115 indicates that the sample under test has undergone the process of mercerization. This test cannot be used satisfactorily on materials treated with durable finishes, or dyed with sulphuric dyes or if fibres other than cotton are present.

The composition of the Committee responsible for the formulation of this standard is given in Annex B.

In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’.

Indian Standard

METHOD FOR DETERMINATION OF BARIUM ACTIVITY NUMBER OF COTTON TEXTILE MATERIALS

(Second Revision)

1 SCOPE

This standard prescribes a method for determination of barium activity number of cotton materials.

2 REFERENCES

The standards listed in Annex A contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of these standards.

3 TERMINOLOGY

For the purpose of this standard, the following definition shall apply.

3.1 Barium Activity Number — The ratio of the quantity of barium hydroxide absorbed by mercerized cotton to that absorbed by unmercerized cotton under identical conditions, multiplied by 100.

4 PRINCIPLE

A sample is taken and completely freed from all sizing and finishing materials. It is treated with barium hydroxide to determine its absorption. The absorption of an unmercerized cotton sample is also determined under identical conditions. The ratio of absorption of test sample and unmercerized cotton sample is expressed as the barium activity number taking the unmercerized cotton as 100.

5 SAMPLING

5.1 Samples shall be selected so as to be representative of the lot.

5.2 Sample drawn as laid down in the material specification or in compliance with an agreement between the buyer and the seller shall be held to be representative of the lot.

5.3 In case of cotton fabrics, the sample shall be drawn in accordance with the procedure given in IS 5463.

6 TEST SPECIMENS AND CONTROL SPECIMEN

6.1 Test Specimens

6.1.1 If the sample under test is yarn, draw from it at least three specimens each weighing about 3 g.

6.1.2 If the sample under test is fabric, draw from it three specimens each weighing about 3 g and preferably square in shape.

6.2 Control Specimen

Draw from the basic (unmercerized, scoured) cotton material a specimen weighing about 3 g.

NOTE — If the basic (unmercerized) material is not available, an unmercerized (scoured) cotton material similar in construction to that under test shall be used for the control.

7 APPARATUS

7.1 Soxhlet extractor

7.2 Drying-Oven — capable of being maintained at a temperature of 105 °C ± 3 °C

7.3 Weighing Balance — capable of weighing to an accuracy of 0.001 g

7.4 Conical Flask — with stopper

7.5 Pipette

7.6 Beaker

8 REAGENTS

8.1 Unless specified otherwise pure chemicals shall be applied in the test. Distilled water (*see* IS 1070) shall be used where the use of water as a regent is intended.

NOTE — ' Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of the analysis.

8.2 Chloroform

8.3 Diastase or other suitable desizing enzyme

8.4 Sodium chloride

8.5 Soap-Soda Solution — containing 20 g of soap and 10 g of anhydrous sodium carbonate per litre. The soap shall contain not more than 5 percent moisture and shall comply with the following composition, dry mass basis:

Free alkali (as Na_2CO_3), *Max*	0.3 percent
Free alkali (as NaOH), *Max*	0.1 percent
Combined fatty acids (as sodium salt), *Min*	85 percent
Titre of mixed fatty acids prepared from the soap, *Max*	30 gm
Iodine value of fatty acids, *Max*	50

8.6 Barium Hydroxide Solution — approximately 0.25 N

8.7 Hydrochloric Acid — 0.05 N and 0.1 N

8.8 Phenolphthalein Indicator — prepared by dissolving 0.5 g of phenolphthalein in 50 ml of ethyl alcohol and diluting to 100 ml with water.

8.9 Bromocresol Purple

9 PROCEDURE

9.1 Take one test specimen.

9.1.1 If the material under test is not heavily finished, desize the specimen as given in **9.1.1.1, 9.1.1.2** or **9.1.1.3** depending on the type of ingredients used in the size or finish.

9.1.1.1 In case it is known that the material is sized or finished with a mixing containing starch but not tamarind kernel powder, dip the specimen in a solution (weighing 20 times the mass of the specimen) containing 5 g of diastase and 10 g of sodium chloride per litre at 70 °C and at a *p*H of 6.5 to 7.7 (*see* Note). Allow the specimen to remain in the solution for one and a half hours. During this period, take it out from the desizing bath and wring it by hand at least three times. At the end of the period remove the specimen, wash it thoroughly four times in hot and cold water successively, using 50 ml of water for each wash.

NOTES

1 The temperature and *p*H given for the desizing solution are the optimum for bacterial diastase. If any other type of desizing enzyme is used, then the temperature and *p*H shall be modified to that recommended by the supplier. As many enzymatic desizing agents slowly deteriorate in storage, care shall be taken to see that the sample of desizing agent, at the time of test, has still satisfactory desizing efficiency.

2 If any doubt exists as to whether the size or finish has been completely removed, the treatment with the enzymatic desizing solution shall be repeated, the specimen being again weighed after drying to constant mass at 105 °C to 110 °C and the percentage loss in mast again calculated. If the value for the percentage loss in mass has increased by not more than 0.25, then it may be considered that complete desizing has been effected, and the second value be accepted as the final value. If the value for the percentage loss in mass has increased by more than 0.25, then the desizing treatment should be repeated until the figure for percentage loss in mass does not differ from the previous figure by more than 0.25.

9.1.1.2 In case it is known that the material is sized or finished with a mixing containing tamarind kernel powder but not starch, boil the specimen in the soap-soda solution (weighing 20 times the mass of the specimen) for 45 min. Wash it thoroughly first in hot water and then in cold water.

9.1.1.3 In case it is known that the material is sized or finished with a mixing containing both starch and tamarind kernel powder or in case the ingredients used in the size or finish are not known, desize the specimen in the manner prescribed in **9.1.1.1** for the specimen known to contain starch and treat it further in the manner prescribed in **9.1.1.2** for the specimen known to contain tamarind kernel powder.

9.1.2 If the material under test is heavily finished with mineral oils and waxes or with salts, extract the specimen with chloroform in a Soxhlet extracting apparatus for one hour, and then desize the specimen as given in **9.1.1**.

9.1.3 Add bromocresol purple to the water extract of the sample and add dilute hydrochloric acid (0.05 N to 0.1 N) drop by drop till it turns yellow. Keep the solution for about 30 min. Remove the extract. Wash the sample with distilled water till it is free from acid.

9.2 Dry the specimen and expose it to room atmosphere for about 4 h, cut the specimen into small pieces. Take exactly 2 g (on oven-dry basis) of the specimen.

NOTE — For calculating the mass of mercerized and unmercerized cotton to be taken for the test, the values of actual regain used are as given below:

Mercerized cotton	9 percent
Unmercerized cotton	6 percent

9.3 Transfer the specimen to a 50 ml conical flask and add 30 ml of barium hydroxide solution to it. Stopper the flask and allow it to stand for at least 2 h, with frequent shaking. At the end of this period, pipette out 10 ml of the clear solution from the flask and titrate it with hydrochloric acid using phenolphthalein as indicator.

9.4 Make a blank determination following the same procedure (*see* **9.3**) but without the test specimen.

9.5 Treat the control specimen in a similar manner (*see* **9.1** to **9.3**) along with the test specimen.

9.6 Similarly test other test specimens.

10 CALCULATIONS

10.1 Calculate the barium activity number by the following formula:

$$\text{Barium activity number} = \frac{a-b}{a-c} \times 100$$

where

a = quantity, in ml, of hydrochloric acid required for the blank (*see* **9.4**);

b = quantity in ml, of hydrochloric acid required lor the test specimen (*see* **9.3**); and

c = quantity, in ml, of hydrochloric acid required for the control specimen (*see* **9.5**).

10.2 Calculate the barium activity number of other test specimens and determine the average of all values obtained.

11 REPORT

11.1 The report shall include the following information:

a) Type of material tested;
b) Number of test specimens; and
c) Barium activity number.

ANNEX A

(*Clause* 2)

LIST OF REFERRED STANDARDS

IS No.	*Title*
IS 5463 : 2022	Methods for sampling of cotton fabrics for chemical tests (*first revision*)
IS 1070 : 2023	Reagent grade water — Specification (*fourth revision*)

ANNEX B

(*Foreword*)

COMMITTEE COMPOSITION

Chemical Methods of Test Sectional Committee, TXD 05

Organization	*Representative(s)*
The Synthetic and Art Silk Mills Research Association, Mumbai	DR MANISHA MATHUR (*Chairperson*)
Agilent Technology India Pvt Limited, New Delhi	SHRI PRAVEEN ARYA DR MANOJ SURWADE (*Alternate*)
Ahmedabad Textile Industry's Research Association, Ahmedabad	SHRIMATI DEEPALI PLAWAT SHRI JIGAR DAVE (*Alternate*)
Bidhata Industries Pvt Ltd, Mumbai	SHRI ROHIT PACHERIWALA R. K. PACHERIWALA (*Alternate*)
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Organization	*Representative(s)*
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